

# **Watershed Summative Assessment Rubrics**

## **Teacher Directions**

### **Prior to Administration:**

1. Make enough copies of the test booklet for each student.

### **During Administration:**

Part I – Students just answer the questions, no special instructions.

Part II – Make sure each student has the following materials:

- Pencil and pen
- Black and white topo map (in booklet)
- Color Land Use Overlay (transparency)
- Two water quality Data Sheets (in booklet)
- One water quality parameter sheet (in booklet)
- One Stream Insects and Crustaceans Sheet (in booklet)

Note: Question # 5: Be sure that students understand how to place the transparency over their maps correctly. [The legend of the transparency is placed over the white box in the upper right hand side of the black and white map.]

Note: Color Land Use Overlay: A color copy of this can be found on the assessment web site at [www.scienceassessment.org](http://www.scienceassessment.org). Color overlays included in the assessment materials are non-consumable and must be returned to the Science Resource Center.

**While scoring please note that if there are two possible codes, select the first one that appears on the rubric.**

1. Below is the picture from an elementary science textbook that illustrates the movement of water. What changes would you make to the illustration to demonstrate a more complete understanding of the movement of water? Be sure to include appropriate labels in your illustration.

This item measures the student's ability to identify where water is stored and the processes that move water through the cycle.

Criteria for a complete response:

1. Includes the sun.
2. Adds transpiration, run-off and groundwater/aquifer/recharge to the illustration.

Code	Response
	<b>Complete Response</b>
<b>20</b>	Meets above criteria.
<b>21</b>	Meets above criteria and identifies aquifers.
<b>29</b>	Any other completely correct response.
	<b>Partially Correct Response</b>
<b>10</b>	Includes sun, and at least two of the following: transpiration, run-off, and groundwater/aquifer/recharge.
<b>19</b>	Any other generally complete response.
	<b>Incorrect Response</b>
<b>70</b>	Does not include sun but does include at least two of the following: transpiration, run-off, groundwater/aquifer/recharge.
<b>71</b>	Does not include sun but does include one of the following: transpiration, run-off, groundwater/aquifer/recharge.
<b>76</b>	Repeats the stem of the question.
<b>79</b>	Any other incorrect response.
	<b>Non Response</b>
<b>90</b>	Crosses out, erases, illegible or impossible to interpret
<b>99</b>	Blank.

2. Explain the path water travels in your diagram.

This item measures the student's ability to explain the water cycle and its cyclical nature.

Criteria for a complete response:

1. Includes all processes that move water through the cycle (i.e. evaporation, condensation, precipitation, transpiration, and run-off).
2. Identifies groundwater/aquifer/recharge as a storage location.
3. Describes cyclical nature of the movement of water.

Code	Response
	<b>Complete Response</b>
20	Meets above criteria.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	Includes four of the five processes and describes cyclical nature of the movement of water.
11	Includes four of the five processes and describes the cyclical nature of the movement of water but includes groundwater/aquifer.
12	Includes all five processes but the cyclical nature of the movement of water is not present.
19	Any other generally complete response.
	<b>Incorrect Response</b>
70	Does not describe the cyclical nature of the movement of water and only identifies fewer than three of the processes.
71	Describes cyclical nature of the movement of water but does not show clear understanding of the cycle.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret
99	Blank.

3. Clay, gravel, and sand are examples of Earth's materials. How does the particle size of these Earth materials determine the rate at which water moves? You may include a diagram in your response.

This item measures the student's understanding of how the particle size of Earth materials effects its porosity.

Criteria for a complete response:

1. Explains the correct relationship between particle size and spaces between the particles (e.g. the smaller the particle size the less space between them.)
2. Explains that the more space between particles the faster the water will move.

Code	Response
	<b>Complete Response</b>
20	Meets criteria above and diagram is correct.
21	Meets criteria above but diagram is not present or is flawed.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	Explains the relationship between particle size and pore space with no relationship to the rate of water movement.
11	Explains the rate of water movement through the Earth materials in regard to pore space not particle size.
12	Explains movement, space, and/or particle size but no rate of movement.
13	Includes a correct diagram but explanation is wrong.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	States that water goes into the ground.
72	Gives description of ground only.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret
99	Blank.

4. Look carefully at the topographic map. The boundary for the Wiggins Mill Pond Watershed has been drawn. Explain why the Delaware Department of Natural Resources drew the boundary for the watershed in this way.

This item measures the student's ability to explain how watershed boundaries are delineated.

Criterion for a complete response:

1. Explains the importance of elevation in determining watershed boundaries because water runs down hill.

Code	Response
	<b>Complete Response</b>
20	Meets above criteria.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	Mentions the idea of elevation but does not include water runs downhill.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	Does not explain the role of elevation in identifying a watershed boundary.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret.
99	Blank.

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| 5. Study your land use and topographic maps. Identify a land use that may affect Wiggins Mill Pond. Is this land use a point-source or a non-point source of pollution? Explain why. |
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This item measures the student's ability to determine if a land use is point source or non-point source pollution, and to explain why.

Criteria for a complete response:

1. Correctly identifies a specific land use as being a point source or non-point source of pollution.
2. Explains that point source pollution is discharged directly into a body of water such as a sewage pipe or that non-point source pollution is not discharged directly into a body of water.

Code	Response
	<b>Complete Response</b>
20	Meets above criteria.
21	Student includes a correct land use, but it is not named from the key (i.e. crops, development, farms etc.) and the response meets the above criteria.
29	Any other complete correct response.
	<b>Partially Correct Response</b>
10	Gives appropriate land use and type of pollution source, but has no explanation.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	Indicates a land use, but fails to include any additional correct information.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret
99	Blank.

6. A recommendation has been made to create riparian buffer zone(s) along Wiggins Mill Pond. The two recommended sites are marked A and B on the map below. Using information from your topographic and land use maps, choose the best location for this buffer zone. Explain your choice using evidence from your maps.

This item measures student's ability to read and interpret a land use map and to determine an appropriate placement and purpose for a riparian buffer zone.

Criteria for a complete response:

1. Selects "A" as the appropriate location for a riparian buffer zone.
2. Explains that placing buffer zone(s) in this location will help limit additional run-off into the pond from the urban area.

Code	Response
	<b>Complete Response</b>
20	Meets above criteria.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	Chooses riparian buffer zone appropriately on the map, but provides no justification.
11	Includes appropriate justification, but fails to choose buffer zone(s) correctly on the map.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	Identifies incorrect location.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret.
99	Blank.

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| 7. Now compare the Wiggins Mill Pond water data sheets to the water quality parameters. Identify any data from the sheets that may indicate a problem with the quality of the water in the pond. What might have caused the problem? |
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This item measures student's ability to interpret data and draw valid inferences.

Criteria for a complete response:

1. Identifies only nitrate and/or dissolved oxygen levels as being problematic.
2. Connects data to appropriate land use or pollution source (fertilizer run-off from farms.)

Code	Response
	<b>Complete Response</b>
20	Meets criteria and identifies both dissolved Oxygen and Nitrates.
21	Meets criteria and identifies only dissolved Oxygen.
22	Meets criteria and identifies only Nitrates.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	Identifies nitrate and/or dissolved oxygen levels as being problematic with no inferences to land use or pollution source being made.
11	Does not identify data but gives appropriate land use, for example agriculture.
12	Identifies nitrate and/or dissolved oxygen levels and one other piece of relevant data only, e.g. pH with no inferences.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	Identifies all data as being problematic.
71	States that there is no problem in the water.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret
99	Blank.



8. Use the data from the Water Quality data Sheets, Stream Insects and Crustaceans Sheet, and Water quality Parameters Sheet. Which invertebrate group (Group One, Group Two, or Group Three) would you expect to find in the pond? Explain your choice.

This item measures student's ability to make a prediction based on evidence and reasoning.

Criteria for a complete response:

1. Predicts that mostly macro invertebrates from group two or three inhabit the pond.
2. Justifies the predictions based on the low dissolved oxygen levels and/or high nitrate levels reported on both data sheets.

Code	Response
	<b>Complete Response</b>
20	Meets the criteria.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	Identifies appropriate macro invertebrate group with no justification.
11	Identifies appropriate macro invertebrate group but has a flaw in the justification, e.g. doesn't mention dissolved oxygen or nitrates or just says pollution.
12	Provides appropriate justification, but no macro invertebrate group is listed.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	Lists macroinvertebrates from group one.
71	States something to the effect of, "macroinvertebrates tell you the health of a stream."
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret.
99	Blank.

9. Scientists who study watersheds spend a lot of time trying to determine what kinds of macro invertebrates live in the watershed. Your neighbors may not understand why this data is important to their lives. How would you explain to your neighbors why the living organism data is important to them?

This item measures student's understanding that the types of macro invertebrates that inhabit a body of water are indications of the quality of water upon which people depend.

Criteria for a complete response:

1. Macro invertebrate data used as indicators of water quality.
2. Explains that people depend on healthy water supplies to meet their needs.

Code	Response
	<b>Complete Response</b>
20	Meets above criteria.
29	Any other completely correct response.
	<b>Partially Correct Response</b>
10	States that macro invertebrates indicate water quality but makes no connection to people dependent upon healthy water supplies.
11	Makes connection to importance of water quality but not macroinvertebrates as indicators.
19	Any other partially correct response.
	<b>Incorrect Response</b>
70	Does not mention macro invertebrates and/or their importance.
76	Repeats the stem of the question.
79	Any other incorrect response.
	<b>Non Response</b>
90	Crosses out, erases, illegible or impossible to interpret.
99	Blank.